REMARKS

Applicant gratefully acknowledges the Examiner's indication of allowance of allowance of claims 5, 6, 15, 19, 20, 28, 33 & 34.

With respect to the Examiner's rejections concerning the remaining claims, the Examiner cited a single references in support of a §102(b) rejection: Bone et al. WO 96/29 829 ("*Bone*"). Applicant respectfully requests reconsideration in view of the foregoing amendments and the following remarks.

Structure and function are the alpha and omega of claim construction. In order to support a §102(b) rejection, the examiner must find the described structure and function in a single cited reference. *Bone*, the cited reference does not disclose a method, product or system which performs the claimed function. Furthermore, *Bone* does not perform its function with the claimed structure.

First consider the claimed function: "*transforming a file of digital color data representing a color image to a new file of digital color data where one or more new colors have been transformed to one or more new color locations where their reproduction is known to be* ***preferred***" (emphasis added). The Examiner cites the following language from *Bone* as equivalent (p 13, lines 11-20):

> Generation of a matte is performed on a pixel-by-pixel (p_n) basis to determine whether a pixel under consideration falls within the rejection area 32, the acceptance area 42 or the roll-off 60. For each frame of image data, each constituent pixel within the frame is stored in a data form to include its colour value together with a key value, k: (R,G,B,k). If a pixel falls within the rejection area 32, then its k value will be 0, hence the pixel colour will be rejected in the finally formed composited image. If a pixel falls within the acceptance area 42, then its k value will be 1, in which case the colour value of that observed is accepted unmodified. If a pixel falls within the roll-off 60, the k value will be in the range $0<k<1$. In that case, the observed image colour value subsequently will undergo the colour prediction and recovery process.

Bone relates to picking colors when creating a single composite image from two separate images. For example, combining a background with a picture of an actor shot in front of a blue screen. The goal is to replace the blue screen pixels with pixels from the background. Several factors can cause difficulty in determining which pixels should be replaced. For example reflections from the blue screen on the actor or shadows on the blue screen or uneven lighting can make it difficult to determine whether the pixel should be replaced. The function of *Bone* is to solve this problem. The invention in *Bone* is the "color prediction and color recovery

process" mentioned at the end of the above-excerpted section cited by the Examiner.

The claimed invention has nothing to do with predicting an actual color or recovering such color. As a general proposition, the claimed invention intentionally moves colors away from the actual color. *Bone* and the present application have opposite functions in that *Bone* seeks to obtain true colors and the present invention seeks to move away from true colors and toward preferred viewing colors.

The Examiner finds that the "rejection galaxies" and "acceptance galaxies" read on the color magnets of claim element 1(b) citing the following section of *Bone* (p12 line1-7):

> Fig. 4 shows a further embodiment showing two mutually exclusive of key colour acceptance galaxies 34_1,34_2 and two colour rejection galaxies 44_1,44_2 residing in the colour volume 10. The invention thus contemplates any number of selectively defined rejection galaxies and acceptance galaxies, thus providing great flexibility in accurately defining all of the key colours occurring in the backdrop against which the foreground objects have been shot, and similarly accurately modelling all of the acceptance colour points occurring in the foreground image.

The Examiner is reading elements of the present invention into *Bone* that are not disclosed in *Bone*. Specifically, the Examiner is reading into *Bone* that its rejection galaxies and acceptance galaxies have a center of influence that affects colors in, or proximate to, the galaxy or center of the galaxy. However, in *Bone*, this is not the case. To the contrary, in *Bone* a galaxy is defined by its brackets. All points within the hard brackets are equally in or out of the galaxy. In the claimed invention a color magnet is defined by its center and the distance dependent function that defines its influence over the other colors. The Examiner states that the "k" value calculated in *Bone* prescribes the behavior of the galaxy citing the following from *Bone* (p16 line 18-26):

> Fig. 10b illustrates an interpolation technique for colour prediction which embodies the assumption that the original colour lies along the line segment connecting the closest accept colour 40_1 and the observed colour 62:
>
> key value = 0 implies that the sampled pixel 62 is replaced by the original colour 40_1.
>
> key value = 0.5 implies that the original colour lies half way between 62 and 42_1.
>
> key value = 1 implies that original colour and the observed colour are co-incident.

The "key value" concept is fundamentally different than the prescribed magnet behavior of the present claim. In *Bone* the key value is a measure of how much of the key color is present in the observed color it is not a behavior. The "key value" in *Bone* is used to predict the original color. See *Bone* (p 16 line 15-17) immediately preceding the section cited by the Examiner:

> **Colour Prediction and Recovery**
>
> Colour prediction and recovery techniques will now be described with reference to Figs. 7a, 7b, 10a, 10b and 10c. Fig. 10a illustrates an extrapolation technique for colour prediction relevant to the rejection area 32 shown in Fig. 9a. This technique embodies the underlying assumption that the amount of key colour blended with the observed colour value is approximately inversely proportional to the key value, and that all recovery colours will lie along the ray defined by the observed colour point under consideration and the closest key colour:
>
> key value = 0 implies that the observed value is all key colour and so the recovered colour is infinitely far along the prediction ray, $x_e = \infty$,
>
> key value = 0.5 implies that the observed value is 50% key colour and 50% original colour, $x_e = 2x_1$, and
>
> key value = 1 implies that there is no key colour present in the observed image.

In *Bone* the "key value is used to predict and recover the original color. It does not prescribe a particular behavior for the galaxy influence - as detailed in the section cited by the examiner as reading on claim element 1(e):

For the colour point 62, as previously shown in Fig. 7a, the distance x_1 is known as 0.55. The extrapolated predicted original colour value, x_e, is determined (step 138) by the following formula:

$$
\begin{aligned}
x_{en} &= r_n + (x_n - r_n)/k_n \\
\Rightarrow x_{e1} &= r_1 + (x_1 - r_1)/k_1 \\
&= 0.2 + (0.55 - 0.2)/0.64 \\
&= 0.75
\end{aligned}
$$

This then locates the extrapolated predicted original colour value 62' at a distance away from the observed colour value 62, as shown in Fig. 10a.

The predicted original colour interpolation value y_{in} is determined (step 158) from the following formula:

$$
\begin{aligned}
y_{in} &= a_n + k_n(y_n - a_n) \\
\Rightarrow y_{i1} &= a_1 + k_1(y_1 - a_1) \\
&= 0.25 + 0.64(0.45 - 0.25) \\
&= 0.38
\end{aligned}
$$

The value y_{i1} therefore locates the predicted original colour 62" at the distance 0.38 from the nearest acceptance point 40_1, as shown in Fig. 10b.

As is apparent from Figs. 10a and 10b, there are two separate predicted original colours 62', 62". It has been determined in the course of experimentation that both techniques provide equally satisfactory results.

Whilst the extrapolation and interpolation methodologies can stand alone, it is equally the case that they can be used in concert, and a further calculation (step 190) performed by way of a linear interpolation to finally locate the original colour $\overline{62}$ point along a line intersecting the predicted colour points 62', 62". This is shown in Fig. 10c.

Once the predicted colour value for the point 62', 62" or $\overline{62}$ is known, then in forming of the composite image (steps 196, 198), the colour value is adjusted to

The interpolation performed in *Bone* is based on the distance of a pixel from both the closest acceptance point and rejection point. Even assuming the equations served a similar function, the equations are **not** "functions of the color space distance and the behavior of a color magnet."

Claim 2.

With respect to Claim 2 the Examiner cites the following language from *Bone* (p11 lines 13-15):

A similar number of representative acceptance colour points 40_n are shown, also as a stylised lumpy ball representation of the galaxy of acceptance colour points. The region between the rejection galaxy 34 and acceptance galaxy 44 is the roll-off, but only for the case where there is no tolerance or buffer (i.e. 'hard clipping') provided with respect to each rejection key colour point 30_n or acceptance colour point 40_n.

The applicant sees no connection with the behaviors of attraction, repulsion, shielding and dragging. In fact in this discussion of *Bone*, if there is any behavior, it is picking pixels from either the foreground or background to make a composite image rather then changing a color based on the behaviors listed in claim 2 for a color magnet.

Claim 3.

The Examiner cites the following language as reading on an attraction magnet (p2 line 1):

> defined. Image colour values falling within the acceptance area are accepted in the matte. The rejection area and the acceptance area are separated by the roll-off. The

This description is more like a color pass filter – if the colors fall within a certain band or "galaxy" (to use the terminology of *Bone*) then it will be used in the matte in making a composite image from two images. There is no disclosure or suggestion to concentrate the colors toward a preferred color. Just to accept or reject colors as they are found.

Claim 4.

The Examiner cites the following language as reading on a repulsion magnet (p1 line 26-27):

> In the keying of an image to generate a matte, an image rejection area firstly is defined corresponding to the key colour. Image colour values falling within the rejection area are rejected from the matte. An image acceptance area can also be

This description is more like a color block filter – if the colors fall within a certain band the then the pixels of this color will be rejected from the matte and will not become part of the composite image. There is not discussion or suggestion that colors be pushed away from the color magnet color.

Claim 7.

The Examiner cites the following language as reading on different color magnet shapes (p12 line 26-27):

For the purposes of illustration, a two-dimensional representation of the colour space will be used. The axes, such as shown in Fig. 9a, are arbitrary, and can be any one of Red/Green, Red/Blue or Green/Blue. Also for the purposes of illustration, only four key colour points 30_1, 30_2, 30_3 and 30_4 and four acceptance points 40_1, 40_2, 40_3

Bone carries on the next page as follows:

and 40_4 lying in the plane of the axes, are shown. It is important to bear in mind, however, that embodiments of the invention operate in three-dimensional space.

these references can be seen in Fig 9a from *Bone*:

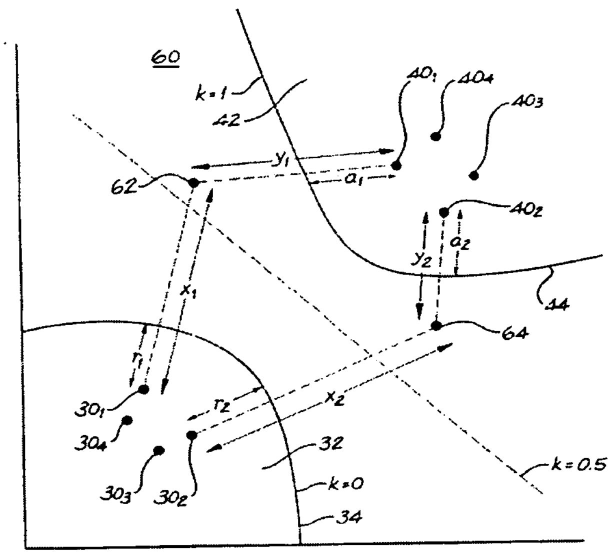

FIG. 9a

This description does not read on claim 7 which provides that the preferred color location (color magnet) can be a point, a line, a plane or a cylinder in color space. Although each of 30_1 30_2 30_3 30_4 40_1 40_2 40_3 40_4 are points none of them serve as preferred colors or a color magnet. Although any two of them can form a line they are not described as such in *Bone* and the line is not used as a color magnet. Similarly though any three of them can define a plane they are not described as such. To the extent that any three can be described as defining a plane they all define the same plane and the k=1, k=0 "galaxies roll over region 0<k<1 are all key colors (keyed for replacement) and all accepted colors.

Claim 8.

The examiner cites the following language from page12 of *Bone* as reading on the limitations added in claim 8:

> Fig. 4 shows a further embodiment showing two mutually exclusive of key colour acceptance galaxies $34_1, 34_2$ and two colour rejection galaxies $44_1, 44_2$ residing in the colour volume 10. The invention thus contemplates any number of selectively defined rejection galaxies and acceptance galaxies, thus providing great flexibility in accurately defining all of the key colours occurring in the backdrop against which the foreground objects have been shot, and similarly accurately modelling all of the acceptance colour points occurring in the foreground image.

There is no mention made of viewer preference. Again, as a general proposition, *Bone* teaches away from the claimed invention because it seeks only to replace key colors with the true original color when compositing two images into one image. For example, if the background is a snow covered mountain and the foreground is a surfer shot in front of a green screen, green pixels in the foreground shot would be replaced by the pixels in the background shot resulting in an image of a surfer on a mountain. This has nothing to do with preferences on the color of the sky in the background or the color of the surfer's tan. The present invention may be used to intentionally shift the colors used in the sky and shield the colors of the surfer's tan or shift them darker in order to get results that are preferable to the viewer. For example the sky might be a deep blue but we would rather see it as more cyan so the blue would be shifted may a color magnet centered at cyan.

Claim 9.

The language from *Bone* cited by the Examiner is has nothing to do with selecting preferred color locations. See *Bone* p 1 lines 14-24:

> To give an example, consider the situation where the desired background image is a view of city buildings shot of a miniaturised set less than a metre in height. The desired foreground image is a person of normal size, and yet the required assembled or composited image must be of a normal size person against a normal size city. This means that the foreground image of the person must be filmed (with the correct framing) separately from filming of the city. To generate the matte of the foreground image, the person is filmed against a colour not found in any portion of the person's image. This colour is called the key colour. The key colour often will be chosen to be blue, however the actual colour depends upon what colours appear in the foreground image. For example, blue would not be used as the key colour if the person is wearing blue jeans, rather green could be substituted.

The cited language has to do with selecting the color of the screen based on the colors in the foreground. This selection has to do with compositing two images, not remixing the colors of an image to get greener foliage and/or bluer skies while shielding skin tones.

Claim 10.

All multidimensional color spaces are not equal. The *Bone*'s cited definition of "Luminance" cited by the Examiner (page18 lines 3-7) is **only** correct for one set of RGB primaries.

> equal to the observed luminance value. Luminance is defined as being the value: (0.299 Red + 0.587 Green + 0.114 Blue) of an RGB colour value. Therefore, a calculation can be performed (step 194) to determine the luminance value of the observed colour point 62 and the colour value of the predicted original colour $\overline{62}$ compensated to be the same.

Bone describes a weighted sum of Red Green and Blue values. This is not the same as working within a full perceptual color space with accurate and uniform correlates of chroma, hue and luminance. CIELab/CIELCH focuses on the human visual system as opposed to RGB which is focused on color rendering systems that additively mix three primary colors. *Bone* is at best limited to rendering systems where you have one set of RGB primaries. This section of *Bone* does not even recognize the problem let alone suggest operating in the CIELab/CIELCH color space. Figure 8 does not disclose a problem with using RGB when dealing with human perception or suggest the solution of operating in CIELab/CIELCH or CIELUV color spaces.

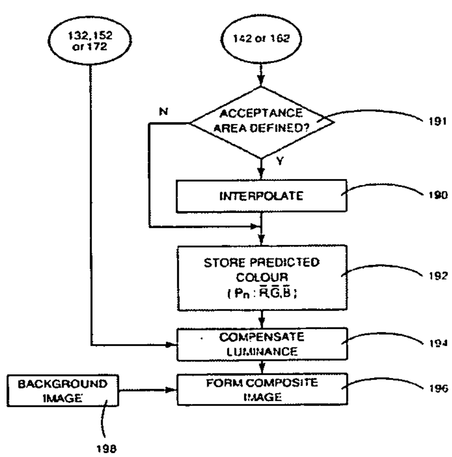

FIG. 8

Claim 13.

The Examiner cited the following equations in *Bone* to introduce anisotropic behavior into the calculation of color space distance:

location of the boundary is dependent upon the image pixel under consideration. These locations are determined from the following formulae:

$$r_n = (\text{rejection clip})(x_n + y_n)$$

$$a_n = (\text{acceptance clip})(x_n + y_n)$$

This is not correct. These equations are merely intermediate values in the calculation of original color. Claim 13 refers to anisotropy in the influence of the color magnet's influence with respect to the dimensions in the multidimensional color space. The cited values in *Bone* have no connection to dimensions of the color space.

Claim 16 & 30 see above response particularly concerning claim 2.

Claim 17 & 31 see above response particularly concerning claim 3.

Claim 18 & 32 see above response particularly concerning claim 4.

Claim 21 see above response particularly concerning claim 7.

Claim 22 see above response particularly concerning claim 8.

Claim 23 see above response particularly concerning claim 9.

Claim 24 see above response particularly concerning claim 10.

Claim 25 see above response particularly concerning claim 11.

Claim 26 see above response particularly concerning claim 12.

Claim 27 see above response particularly concerning claim 13.

Claim 29 see above response particularly concerning claim 1.

It is respectfully submitted, therefore, that in view of the above amendments and remarks, that this application is now in condition for allowance, prompt notice of which is earnestly solicited.

Respectfully submitted

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